LUBRICATING SYSTEM FOR ROTARY VANE PUMPS

Filed May 24, 1939 2 Sheets-Sheet 1

Fig. 1.

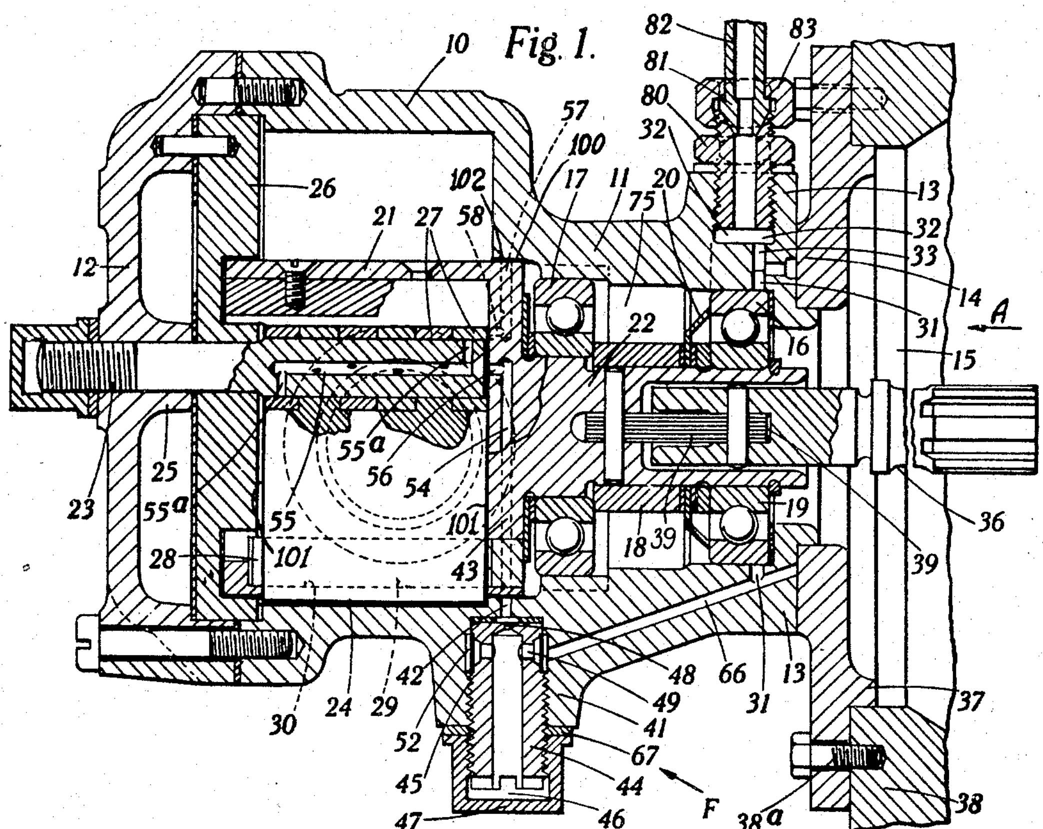
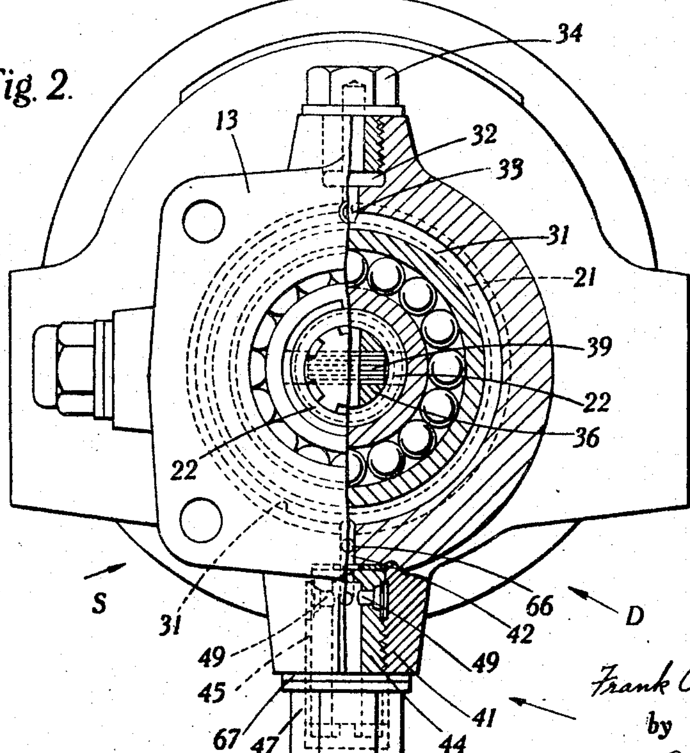


Fig. 2.



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June 3, 1941. F. C. FULCHER 2,243,898

LUBRICATING SYSTEM FOR ROTARY VANE PUMPS

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Fig.4.

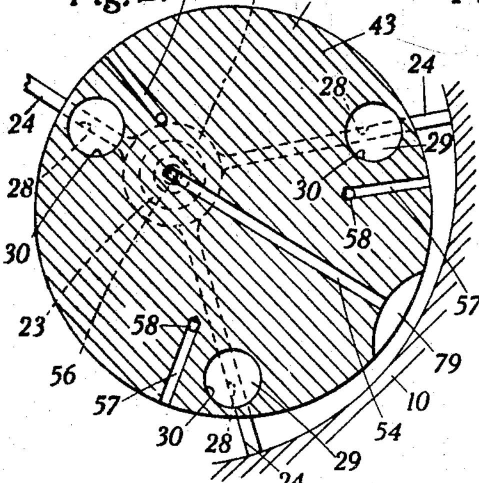


Fig.9.

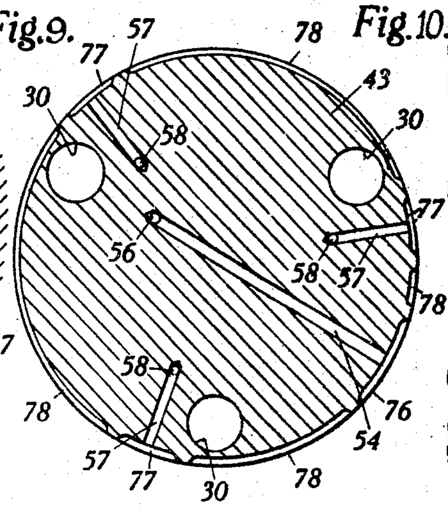


Fig.10.

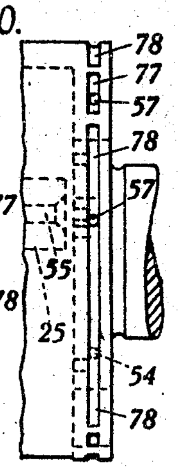


Fig.5.

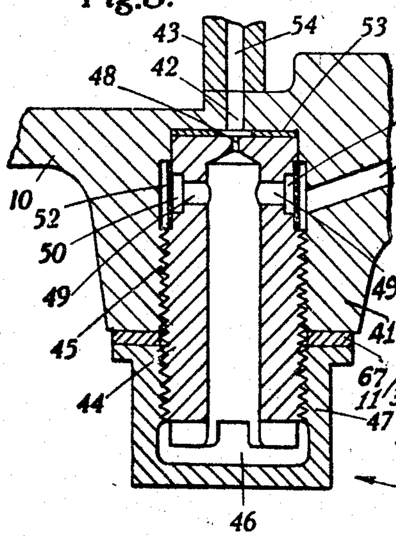


Fig.8.

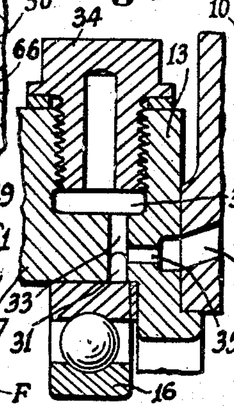


Fig.6.

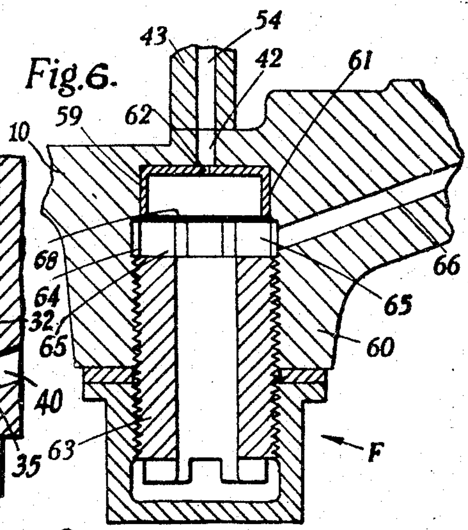


Fig.7.

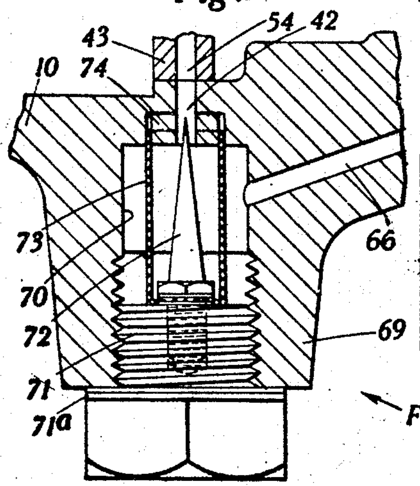
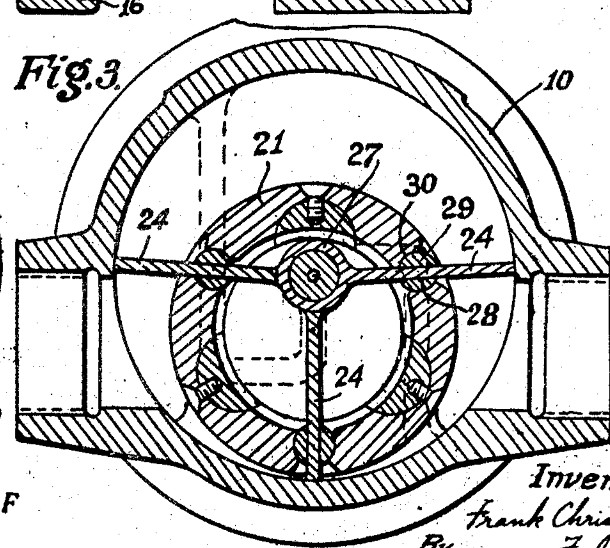


Fig.3.



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UNITED STATES PATENT OFFICE

2,243,898

LUBRICATING SYSTEM FOR ROTARY VANE PUMPS

Frank Christian Fulcher, Purley, England

Application May 24, 1939, Serial No. 275,453
In Great Britain October 12, 1938

6 Claims. (Cl. 230—207)

The present invention relates to rotary pumps for displacing a gaseous medium of the kind in which angularly spaced co-axial vanes or blades mounted to rotate within a chamber having suction and discharge port are arranged to pass through slots in the wall of a barrel-like rotor which also rotates within the chamber upon an axis eccentric to that of the vanes, so that in the rotation of the vanes and rotor the slotted portions of the latter slide to and fro along the vanes and thereby the angular distance between the vanes is varied to obtain the requisite pumping effect.

The invention is particularly designed for duty as a so-called vacuum pump for the operation of the various instruments, gauges and de-icer equipment on aircraft.

In pumps of the kind referred to above, the barrel-like rotor is journalled in a casing which contains the working chamber and is provided with axially extending slots in which the vanes or blades are slidably guided. The outer extremities of the vanes or blades may have a clearance from the inner surface of the working chamber, but the inner ends of the vanes freely contact with a common axial pin or carry hinge portions which are rotatably mounted upon a common spindle. Each such pump has therefore a plurality of more or less contacting and relatively moving surfaces between which, in practice, it is highly desirable to maintain a film of oil or other lubricant if undue frictional losses and wear of the parts is to be avoided. To this end it is usual to lubricate such pumps with the aid of a pressure lubricating system whereby a fluid lubricant is forced along ducts or conduits formed in the walls of the casing of the mechanism so that the lubricant in fluid or vaporous state is forced between the relatively moving surfaces to create the requisite film therebetween.

The constructional nature of such pumps is such that any lubricant which is forced between the moving surfaces in excess of the quantity necessary for creating the requisite film will, in all probability, find its way into the working chamber and thus be lost from the lubricating system while forming an addition, which in many cases is undesirable, to the fluid discharged by the pump in operation.

In considering the problem of avoiding such undesirable waste of lubricating fluid and the sometimes injurious effect of such waste fluid upon the pump discharge, it should be appreciated that the temperature of the pumps increases considerably during operation for any appreciable length of time so that although in known constructions thereof the arrangement may be such that the feed pressure of the lubricant maintains a good film thereof between the relatively moving surfaces without waste or flooding when the pump commences to operate and therefore is at a normal temperature, the clearances between the said surfaces increase as the temperature of the device is raised during its continued operation whereupon the flow of lubricant increases in proportion to the increased cross-sectional area of said clearances and tends to flood into the working chamber.

One object of the present invention is to obviate the above-described disadvantage of known lubricating systems of pumps of the kind herein defined, by providing a pressure lubricating system in which the flow of lubricant is regulated and thereby the delivering capacity of the system determined for any given oil supply pressure without being affected by increase in the clearances between the surfaces to be lubricated.

An important object of the invention is to apply a regulated flow pressure lubricating system to a pump of the kind above set forth and constructed in accordance with the invention described in my co-pending United States patent application lodged on May 24, 1939, under Serial No. 275,454, in which a reduced portion of the rotor is journalled cantilever fashion in bearings positioned at one extremity only of the rotor, so that the rotor proper can rotate without contact with a bearing surface.

Rotary pumps of the kind set forth above are commonly housed in a casing formed with a neck terminating in a mounting flange which is rebated upon its face to accommodate an adaptor plate or engine pad which facilitates the mounting of the pump upon, for example, the crank case of the engine which drives the pump. Accordingly, another object of the invention is to construct a rotary pump of the kind defined, with an improved regulated flow lubricating system which is fed under pressure, if desired through the engine pad, with lubricant from the engine lubricating system or with lubricant from another source according to which is most convenient.

A further object of the invention is to provide a pump of the kind set forth above with a pressure lubricating system including a flow regulating device which is disposed intermediate the suction and delivering sides of the pump and preferably at the lowermost point of the casing of the pump or motor so that the operative pressure differential thereof assists in circulating the lubricant over the entire lubricating system.

In one convenient constructional form, the flow regulating device may be fed from an annular lubricating groove formed in the inner surface of the casing wall to provide a distributing channel fed by a duct which communicates with an oil hole in the engine pad, but other modes of conducting the oil to the annular lubricating groove may be adopted e. g., an opening located preferably in the upper part of the pump casing may be adapted in known manner for connection to a feed pipe along which the lubricant is pumped from an external source of supply or from the engine lubricating system. A further duct or ducts which enters or enter the annular channel preferably at or adjacent the lowermost point thereof extends or extend to a flow regulating device provided in the casing in accordance with the present invention.

The flow regulating device may conveniently communicate with passages leading to the hinges of the vanes and to the vane-guiding slots in the rotor. Furthermore, the flow regulating device may lie at the lowermost part of the pump or motor casing, intermediate the intake and discharge sides thereof, while the lubricant ducts in the rotor communicate with the flow regulating device or with segmental grooves in the peripheral surface of the rotor, the ducts or grooves successively registering with the flow regulating device as the rotor rotates. Thus paths are set up for the passage of the lubricant from the flow regulating device to the contacting, relatively moving surfaces of the pump.

One of the difficulties of lubricating pumps of the kind herein described is that of distributing the oil over the working parts to which oil is not directly conveyed and this is achieved according to the present invention by delivering oil in the form of mist to the working chamber wherein the gaseous medium is being displaced so that the air-borne oil is freely distributed over such working parts. For this purpose there is included in the lubricant passage a gap which is formed by co-operating relatively rotating surfaces and opens into the working chamber, the surfaces being of a diameter at least substantially the diameter of the rotor so as to move relatively to each other at least as fast as the peripheral speed of the rotor. From this gap the oil is delivered into the working chamber in a mist and in order that the lubricant shall not stream through the gap the regulating device is situated in advance thereof and permits the flow through the gap of only such quantities of lubricant as will enable the latter to be broken up and distributed around the rotor.

Other objects and features of the invention will become apparent from the constructions hereinafter more specifically described.

Constructional forms of the invention embodied, by way of example, in a rotary vane pump of the kind above referred to, are hereinafter described with reference to the accompanying drawings in which—

Fig. 1 is a sectional, side elevation of a rotary vane pump according to the present invention, as particularly constructed for duty as a vacuum pump on aircraft for the operation of suction driven flight instruments and gyropilots and to provide ample discharge pressure for the operation of de-icer equipment, embodying a regulated flow pressure lubricating system.

Fig. 2 is a part sectional end view of the pump looking in the direction of the arrow A (Fig. 1).

Fig. 3 is a cross sectional view of the pump illustrating the relation of the vanes to the rotor barrel and pump chamber.

Fig. 4 is a cross sectional view of the rotor barrel, showing the layout of the lubricating ducts.

Fig. 5 is a detail, drawn to a larger scale, of the flow regulating device shown in Figs. 1 and 2.

Fig. 6 is a detail view of an alternative constructional form of flow regulating device.

Fig. 7 is a detail view of another alternative constructional form of flow regulating device.

Fig. 8 is a fragmentary detail view drawn to a larger scale, showing a convenient manner of connecting the lubricating system of Figs. 1 and 2 to the lubricant within an engine crankcase upon which the pump is mounted.

Fig. 9 shows in end elevation a modified arrangement of the lubricant feed ducts in the rotor barrel, and

Fig. 10 is a fragmentary view at right angles to Fig. 9.

The construction of the pump arrangement as shown in Fig. 1 of the appended drawings is as specifically described in my co-pending United States patent application lodged on May 24, 1939, under Serial Nos. 275,454, 275,455 and 275,456.

For the purpose of the present application it is sufficient to indicate that the moving parts of the pump are housed in a casing 10 closed at one end by a sealing plate 12 and provided at the other end with a reduced neck portion 11 which terminates at its free end in a flange 13, the latter being rebated upon its outer face to seat the axially projecting boss 14 of an annular flanged adaptor plate 15.

The neck 11 houses a pair of radial type ball bearings 16, 17 spaced apart by a spacing tube 18 and spacing washer 19 which abut the inner races of ball bearings 16 and 17 respectively, and clamp between their adjacent extremities a resilient dished sealing washer 20 so that the outer peripheral edge of the sealing washer presses against the inner face of outer race of ball bearing 16. The construction and function of washer 20 is fully disclosed in my co-pending application Serial No. 275,454 referred to above, and it is sufficient merely to mention here that it serves to lessen loss of vacuum or pressure in the pump or motor by leakage along the neck of the device; to prevent the flow of lubricant from the interior of the pump into the crankcase of the engine; and to prevent an excessive amount of oil passing through the engine pad into the pump, and also acts virtually to seal off an annular space 75 between the bearings 16 and 17 in which a comparatively cool lubricant can accumulate.

The ball bearings 16, 17 nest in stepped annular recesses in the inner peripheral wall of casing neck 11 and serve to journal the reduced axial extension 22 of the rotor barrel 21 so that the latter is rotatably supported cantilever fashion to project into the pumping chamber of the casing 10. The free end of the rotor barrel is open and projects into a ported insert plate 26 which lies against the undished portions of the inner face of the sealing plate 12 in operative association therewith as disclosed in my co-pending application Serial No. 275,455, to which reference is made above.

The axle 22 of the rotor barrel is hollow to form a sleeve which houses one end of a splined driving shaft 36 and flexible means 39 for coupling the rotor and driving shaft as disclosed in my copending application Serial No. 275,456, to which reference is made above.

The adaptor plate 15, through which the driving shaft projects, has an axially extending spigot 37 which engages a hole in the engine pad 38 of the engine crankcase and is secured therein by studs 38a so as securely to mount the pump in such manner that the splined driving shaft 36 projects into the crankcase for engagement with a driving sprocket (not shown).

The openings in the centres of the adaptor plate 15 and engine accessory pad 38 permit oil from the crankcase to lubricate the flexible coupling 39 between rotor and driving shaft, and the ball bearing 16.

The vane spindle 23, mounted at one extremity in a boss 25 in the sealing plate 12, extends axially inwards through the insert plate 26 so as to project into the rotor barrel to act as an axle for the pump vanes 24 which are mounted upon the spindle 23 in the manner of hinge flaps. The spaced knuckles or butts 27 of the several hinged vanes interleave and embrace the spindle 23 in bearing contact therewith, while the flap of each vane slidably contacts with the sides of guide slots 28 extending longitudinally and diametrically of rotor pins 29 of circular cross section, which are rotatably mounted in axially extending slots 30 of appropriate cross section formed in the wall of the rotor barrel 21. Clearances 101 are provided between the diametrical edges of the rotor vanes 24 and the adjacent faces of the end wall of the rotor barrel and ported insert plate, but the outer, axially extending edges of the vanes may make contact with the inner wall of the pump chamber of casing 10.

It will be clear to those skilled in the art that it is necessary or at least desirable to lubricate all of the surfaces of the pump structure which are relatively moving and in bearing contact as above described and for such purpose a lubricating system is arranged according to the present invention. To this end, the lubricant is fed under pressure to an annular recess or groove 31 formed in the inner peripheral wall of the casing neck 11 in a diametrical plane occupied by the ball bearing 16 so that the outer race of the latter blinds the groove 31 to form it into a closed channel.

The groove 31 communicates, by means of a short, diametrically extending duct 33 with a reservoir 32 located at the top of the casing neck and formed by a tapped bore in which a hollow connecting plug 80 is engaged. The plug 80 is adapted for connection to the nozzle 81 of a lubricant supply conduit 82, the nozzle 81 being coupled to plug 80 by a union nut 83. The conduit 82 is connected to a pressure lubricant supply which may be pumped from the engine case or may emanate from an entirely separate source.

Alternatively, as shown in Fig. 8, the pump may be mounted directly upon an engine accessory pad and it may then be desirable to feed the annular groove 31 and reservoir 32 with lubricant through a passage in the engine accessory pad. In this case the reservoir 32 located at the top of the casing neck and formed by a tapped bore is closed by a threaded, hollow plug 34, while the lubricant is fed to the groove 31 and reservoir 32 through an axially extending duct 35 which may be connected to any source of pressure lubricant supply, but in the construction now being described is in communication with a passage 40 leading through the wall of the engine pad 38 so as to connect the groove 31 to the lubricating oil under pressure in the crankcase.

The groove 31 communicates at its lowest level with a passage 66 which extends along the wall of the casing neck 11 and slopes downwards towards a flow regulating device F which is housed in a boss 41 formed in the casing of the pump and positioned in the vertical axial plane thereof so as to lie between the suction side S and discharge side D of the pump.

Although desirable in many cases to locate the flow regulating device F in the angular position above described, it is possible for example to locate it at any other point in the same diametrical plane as that occupied by the device in the appended drawings.

The boss 41 is bored to provide a duct 42 which leads through the wall of the casing 10 and lies in a diametrical plane contained in the thickness of the end wall 43 of the rotor barrel 21 thereby to lead into a fine annular gap or clearance 100 between the relatively moving peripheries of the end wall 43 of the rotor barrel 21 and the surrounding cylindrical wall of the aperture 102 in the casing extension 11. The boss 41 is counterbored to form a shouldered recess 45 to receive a jet plug 44, through which the lubricant is supplied to the duct 42. The jet plug 44 in the form shown in Figs. 1, 2 and 5, is a hollow, cylindrical member externally screwthreaded intermediate its ends for engagement with the lower portion of the wall of the counterbore 45 which is appropriately tapped for such engagement, and reduced in diameter adjacent its upper extremity to make a close fit in the upper unthreaded portion of the counterbore 45.

The jet plug 44 is of sufficient length to project to an appreciable extent from the boss 41, and the outwardly projecting portion of the plug is screwthreaded to receive a flanged cap nut 47. A packing washer 67 is interposed between the flanged peripheral edge of the cap nut 47 and end face of boss 41 to seal the joint between these members, and the cap nut has sufficient axial length to leave a space between its bottom and the lower end of the jet plug to form with the plug bore a well or reservoir 46.

The jet plug 44 opens at its lower extremity into the well 46, and the lower peripheral edge thereof is cross-slotted for engagement with a tool for rotating the plug. The upper extremity of the plug is closed by a wall bored with a comparatively fine bore jet orifice 48 which is coaxial with the duct 42 and body of plug 44. The hollow interior of the plug 44 is entered by diametrically extending passages 49 which lead from an annular recess 50 formed in the outer peripheral surface of the upper, reduced portion of the plug 44 and registering with the lower end of the passage 66. The edges of the recess 50 are counter-recessed to form a wider recess which receives a collar 52 of gauze or like foraminated material to act as a filter for the lubricant fed into the flow regulating device.

A packing washer 53 is interposed between the top of the counterbore 45 and top of the plug 44 to seal the joint between the opposed surfaces.

The alternative arrangement of the flow regulating device shown in Fig. 6, is adapted to be housed in a boss 60 constructed and located in the casing 10 and provided with a duct 42 in a manner similar to that described in reference to boss 41 of Fig. 1. The boss 60 is bored to provide the duct **42** leading through the wall of the casing, and counter-bored to form a shouldered recess **61** which receives a jet **59** in the form of a dished or skirted washer having a jet orifice **62** which registers co-axially with duct **42**. The flow regulating jet makes an easy push fit with the shouldered recess **61** so as to be readily removable when it is desired to substitute another jet therefor, or clear the existing jet.

The outer end of the recess **61** of boss **60** is counterbored and tapped to receive a threaded, hollow plug **63**, the hollow interior of which forms part of a reservoir or well for the lubricant. The upper extremity of plug **63** is reduced in diameter to provide an annular groove **64** which registers with the appropriate end of the oil passage **66** and opens into the interior of the hollow plug through radial passages **65** provided in the reduced end wall of the plug **63**.

A gauze filtering washer **68** is interposed between the outer peripheral edge of the jet **59** and inner end of plug **63** to aid in preventing the clogging of the jet by foreign matter contained in the lubricant.

As shown in Fig. 7, in a further alternative arrangement of the flow regulating jet, the boss **69** is bored to provide the duct **42** which passes through the wall of the casing **10**, and counterbored to form an enlarged recess **70**, the outer part of the wall of which is tapped to engage a screwthreaded plug **71** which is of shorter axial length than the recess **70** so that a space is left between the top of the recess and inner end of the plug to form a well or reservoir for the lubricant which enters therein through the passage **66**.

The plug **71** beds upon packing washers **71***a* and carries at its inner end an axially extending tapered needle **72** which enters the duct **42** so as more or less to restrict the flow of lubricant through the duct according to its axial setting.

A filter cup **73** of gauze, provided in the bottom thereof with a hole for the passage of the needle **72**, is set around the needle with the peripheral edge of its open end seating in an annular-recess **74** formed in the top of the recess **70**. The filter cup **73** which, together with its recess **74**, may be cylindrical or any other desired shape, acts to filter the lubricant as the latter passes from the reservoir in the boss to the duct **42**. The axial setting of needle **72** may be adjusted by substituting packing washers **71***a* of different thickness or different numbers thereof and/or by adjusting the needle axially relatively to the plug **71**.

Referring to Figs. 1 and 4, it will be seen that the end wall **43** of the rotor barrel is provided with a passage **54** which lies in the diametrical plane occupied by the duct **42** and opens into an arcuate slot **79** which is formed in the peripheral surface of the rotor barrel so as periodically to register with and pass across the inner end of duct **42** as the rotor barrel revolves. The width of the slot **79** is equal to the diameter of the oil passage **54**.

The passage **54** extends radially inwards slightly beyond the axial centre of the vane spindle **23**, and a duct **56** co-axial with the spindle axis leads from passage **54** and opens into the inner surface of the rotor end wall **43**.

The spindle **23** is provided with a concentric, axially extending passage **55** which has a flared mouth opening into the face of the free end of the spindle so as intermittently to register with the duct **56**. Short, diametrically extending ducts **55***a* lead from passage **55** to the peripheral contacting surfaces of spindle **23** and the butts **27** of vanes **24**.

Further passages **57** in the end wall of the rotor extend radially inwards from the outer peripheral surface thereof. The passages **57** also lie in the diametrical plane containing the duct **42**, and open into the outer peripheral surface of the rotor barrel so as periodically to register with the inner end of duct **42** as the rotor barrel rotates. Short, axially extending ducts **58** leading from passages **57**, open into the inner face of the end wall **43** of the rotor barrel, the ducts **58** being angularly spaced around the rotor wall with each duct lying adjacent the inner end of a bearing slot **28**, so that lubricant ejected from the ducts under pressure is fed to the contacting surfaces of bearing slots **28** and **30** and rotor pins **29**.

The operation of the lubricating system becomes obvious from the specific description set forth above and needs to be but briefly recapitulated as follows:

When the engine to which the pump is attached commences to operate, oil under pressure is forced into the reservoir **32** either from the conduit **82** (Fig. 1) or through the oil passage **40** and duct **35** (Fig. 8) and finds its way into the annular channel **31**. The oil finds its way around the annular channel **31** partly by gravity and partly by pressure.

From oil channel **31** the oil flows through passage **66** to the flow regulating device F and accumulates in the reservoir therein from whence the oil is fed through the jet orifice **48** to the duct **42**.

During the rotation of the rotor barrel **21** the recess **79** and passages **57** register successively with duct **42** and receive oil therein. The oil in recess **79** flows along passage **54** and duct **56** into the axial passage **55** in the vane spindle from whence the oil is fed through ducts **55***a* to the contacting bearing surfaces of vane spindle and vane butts.

The oil in passages **57** is ejected through the end wall **43** of the rotor barrel so as to contact with the peripheral bearing surfaces of the rotor pins **29** and also finds its way to the inner peripheral surface of the rotor barrel and outer axial edges of the vanes **24**. The outer peripheral surface of the rotor barrel, where it co-operates with the inner peripheral surface of the casing neck, is freely lubricated by oil from the duct **42**, and oil from the same source finds its way into the ball bearing **17**, and into the recess **75** between sealing washer **20** and bearing **17**, in which recess comparatively cool oil accumulates and tends to cool the walls of the casing neck so as to limit the expansion thereof and therefore the clearances between said wall and outer races of the bearings, thus to prevent inadvertent turning of said outer ball races relative to the wall of said casing neck.

The size of the relatively fast moving peripheries of the end wall **43** of the rotor barrel **21** and the corresponding portion of the neck **11** has the effect that the oil is delivered into a fine annular gap between running parts of a size which produces a high peripheral speed, which causes the oil to be delivered in the form of mist into the working chamber wherein the air is being displaced so that the air-borne oil is well distributed over the working parts to which oil is not directly conveyed, and particularly the vanes which in their movement carry the oil to their slide guides.

The amount of oil allowed to reach the said gap and to feed the ducts and passages of the lubricating system is controlled by the flow-regulating device F with its jet 48 which is so selected or adjusted that only such a quantity will flow to the gap as will enable the lubricant to be broken up, and in choosing the size of the jet regard is had to the fact that an enlargement in the clearance between the surfaces forming the gap is liable to occur after the pump has been running for some time and has become heated. This control may be readily effected by the use of selected jets or washers or by the adjusting of an adjustable flow-regulating device such as that described with reference to Fig. 7 of the drawings.

In each of the flow regulating devices described above with reference to Figs. 4 and 5 respectively, the flow of the lubricant through the jet may readily be varied by changing the jet or washer for one having a flow regulating orifice of different cross sectional area.

In the modified arrangement shown in Figs. 9 and 10 the lubricant passages 54 and 57 open at their outer extremities into segmental portions of an interrupted annular groove extending around the periphery of the rotor barrel. Passage 54 opens into groove segment 76, and passages 57 enter groove segments 77, while groove segments 78 are segregated from all of the passages.

During the rotation of the rotor barrel 21 the lubricant in groove segment 76 passes along passage 54 to lubricate the vane bearing surfaces, and the lubricant in groove segments 77 passes along passages 57 to lubricate the bearing surfaces of rotor pins 28 and vanes 24, while the lubricant in groove segments 78 is distributed to the mutual bearing surfaces of rotor barrel and casing.

The invention should not be regarded as restricted to pumps as above described with reference to the accompanying drawings or to pumps which are driven in the manner above described.

I claim:

1. A high speed rotary pump of the character described for displacing air or other gases comprising a casing defining end and peripheral walls of a work chamber, inlets and outlets in said casing communicating with said chamber, a cylindrical rotor eccentrically positioned in said chamber, one of said end walls of the work chamber having a cylindrical aperture for receiving an end portion of said rotor and forming a fine annular clearance space between the external periphery of the rotor and the inner periphery of said surrounding aperture, said fine annular clearance being coincident with the external surface of the rotor and communicating directly with the interior of said work chamber, reduced journal means extending from said rotor wholly to one side of the end of the barrel portion of the rotor and cooperating bearing means in the casing for rotatably supporting the barrel portion of the rotor cantilever fashion in the work chamber and so that the wall of said cylindrical aperture in the casing takes no part in supporting the rotor, a plurality of vane members and means within the rotor for supporting the vanes to rotate in said work chamber, slots in the circumferential wall of the barrel portion of the rotor through which the vanes pass so as to project inside and outside of the barrel portion and permit of a relative sliding movement between the barrel and the vanes when the rotor and vanes turn and the outer edges of the vanes are carried round said peripheral wall of the work chamber, a lubricant supply passage for receiving lubricant under pressure, said passage communicating with said annular clearance between the barrel periphery and the cylindrical surface of the said aperture in the casing so that by virtue of the high peripheral speed obtainable by said peripheral barrel portion relative to the surrounding wall of the aperture the lubricant can be delivered into the chamber in the form of a fine mist and deposited as such on the moving parts therein, and a lubricant-flow regulating device arranged in said passage ahead of said fine clearance, which serves to control the flow through said clearance and maintains the flow unaffected by variations in the dimensions of the fine clearance incident to the running of the pump.

2. A high speed rotary pump of the character described for displacing air or other gases, comprising a casing having a circular chamber and including removable means for closing one end of said chamber, said casing defining peripheral and end walls of a working chamber and having inlet and outlet passages communicating with said chamber, a hollow axial extension from said casing, a rotor eccentrically positioned in regard to said chamber and comprising a cylindrical barrel portion which longitudinally bridges the ends of said chamber and has an end wall having a projecting reduced axial extension, a cylindrical aperture in the form of an annular recess in the said removable end wall and a cylindrical aperture in the opposite end wall, the walled end of said barrel intruding into said latter aperture as to be telescoped thereby and the free end of the barrel intruding into said recess so that fine annular clearances leading directly to the work chamber are formed between the exterior peripheral portions of each end of the barrel and the surrounding cylindrical walls of said apertures, bearings in said hollow extension of the casing cooperating with said rotor extension and thereby supporting the barrel cantilever fashion in said work chamber and said end peripheries in spaced relation to the surrounding walls of said annular recess and cylindrical aperture so that said fine clearances are maintained, said barrel having slotted bearings and longitudinally slotted pins rotatably arranged in said slotted bearings, vanes passing through the slots in said rotatable pins in sliding relation thereto, bearings rotatably supporting said vanes about their axis of rotation, said vanes extending radially of the chamber so that their ends can sweep round said peripheral wall of the chamber, a lubricant supply passage in said casing opening into one at least of said fine clearance apertures at the ends of the rotor barrel through which lubricant may be fed under pressure into the clearance aperture for delivering lubricant from the latter in a mist form into the working chamber and in contact with the moving parts therein and a lubricant flow regulating device arranged in said passage ahead of the clearance aperture for controlling the flow through said clearance.

3. A high speed rotary pump of the character described for displacing air or other gases, comprising a casing having a circular chamber and including removable means for closing one end of said chamber, said casing defining peripheral

and end walls of a working chamber and having inlet and outlet passages communicating with said chamber, a hollow axial extension from said casing, a rotor eccentrically positioned in regard to said chamber and comprising a cylindrical barrel portion which longitudinally bridges the ends of said chamber and has an end wall having a projecting reduced axial extension, a cylindrical aperture in one of said end walls of the casing for receiving the walled end of the barrel and which forms with the cylindrical peripheral surface of the intruding portion of the barrel, a fine annular clearance therebetween, bearings in said hollow extension of the casing cooperating with said rotor extension and thereby supporting the barrel cantilever fashion in said chamber and maintaining said fine annular clearance, said barrel having slotted bearings in its circumference and longitudinally slotted pins rotatably arranged in said bearings, bearings within the barrel rotatably supporting said vanes about their axis of rotation, said vanes extending generally radially of the barrel into the chamber so that their ends can sweep round said peripheral wall of the chamber, a plurality of non-communicating circumferential grooves formed around the surface of said intruding peripheral end portion of the barrel, a plurality of ducts extending radially inwardly from said grooves through said end wall of the barrel and communicating at their inner ends with the interior of the work chamber at points adjacent the said pins, vanes and bearings, and a lubricant supply passage opening into said aperture for supplying lubricant under pressure to said clearance for delivery from the latter in a mist form laterally into the working chamber and for delivery through said radial ducts to the pins and vanes and their bearings, and a lubricant flow regulating device arranged in said passage ahead of said clearance aperture for serving to control the flow through said clearance and into said ducts.

4. A rotary vane pump as in claim 1, in which the flow regulating device comprises a removable hollow plug member screw threaded into the casing in the general plane of the end wall of the rotor barrel said plug having a jet orifice at its inner end leading to said fine clearance aperture, the hollow stem of said plug being provided with filtering means for cleaning the lubricant in advance of its flow through the jet.

5. A high speed rotary pump according to claim 2, in which said bearings in said hollow extension of the casing comprise a pair of antifriction bearings axially spaced from each other in said hollow extension of the casing, means for sealing off the outer bearing and the outer end of the said hollow extension from the working chamber of the pump, said clearance between the peripheral end of the rotor barrel and the surrounding wall of said cylindrical aperture communicating with the interior of said sealed extension so as to permit lubricant to be fed to said inner bearing, means for mounting said casing onto a lubricated pump driving apparatus, the outer end of said hollow interior of the extension being open to permit entry of lubricant from said driving apparatus to the said outer bearing.

6. A high speed rotary vane pump according to claim 2 in which said end wall of the barrel is provided with inwardly extending ducts the inner ends of which open into the barrel interior for supplying lubricant to said vanes and pins and said bearings therefor, said ducts opening into the exterior periphery of the walled end of the barrel in a position to register successively with the said lubricant supply passage in the casing when the barrel is rotated so as to permit lubricant to be directly conveyed across said fine clearance into the ducts in the end wall of the rotor and to the parts lubricated by said ducts.

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